

## **Preliminary study investigating trunk fatigue and cognitive function in event riders during a simulated jumping test**

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The aim of the study was to investigate trunk muscle fatigue, cognitive function and perceived pain levels during a simulated jumping test.

**Method:** Eight adult riders participated in a riding test on a Racewood Event simulator for 10 minutes over a continuous jumping programme. The Surface EMG activity of six trunk muscles were bilaterally measured at every minute and normalized root mean squares (RMS) and median frequencies (MDF) were computed from EMG power spectra. Visual analogue scales (VAS) measuring fatigue and pain level and cognitive function ‘tapping’ tests were performed before and after the riding test.

**Results:** Average MDF values for all muscles differed significantly between each sample minute ( $p=0.017$ ). A consistent decrease from minute 1 to 9 was not found, suggesting the trunk muscles fatigues and then recovered as other muscle groups important in maintaining the riding position during dynamic movement compensated. Differences between the MDF and RMS of different muscles were highly significant ( $H=213.01$ ,  $DF=5$ ,  $p < 0.001$ ), supporting previous anecdotal evidence that different trunk muscles carry out different roles of posture maintenance during riding. RMS values were not significantly different between the sampled minutes or between riders, suggesting the riding test produced a consistent and repeatable effect on the trunk muscles. MDF values differed significantly between riders ( $H=50.8$ ,  $DF = 5$ ,  $p < 0.001$ ), suggesting individuals may experience localised muscular fatigue of the same test differently, and that other parameters of physical fitness should be investigated to provide conclusions. Lumbar muscles were shown to be important in maintaining the position, therefore physical training program should focus on these areas. No significant differences were found between pre- and post-riding test VAS Pain and Fatigue scores or cognitive function test scores, suggesting the riding test was not significantly fatiguing for participants. However, a near significant correlation was found between time of riding test and VAS Pain score ( $p = 0.06$ ), suggesting somatic pain may be a limiting factor to performance.

**Discussion and Conclusion:** The findings suggest the simulator riding test was not sufficient to provoke fatigue in the riders trunk muscles, however foundations for future studies have been laid to enable methodologies in realistic eventing settings. Whilst the SEMG does not show muscle fatigue over the course of the test, riders perceived and increase in fatigue and also and increase perceived pain. Whilst the area of pain was not supported the finding are in keeping with other studies suggesting riders experience pain whilst riding.

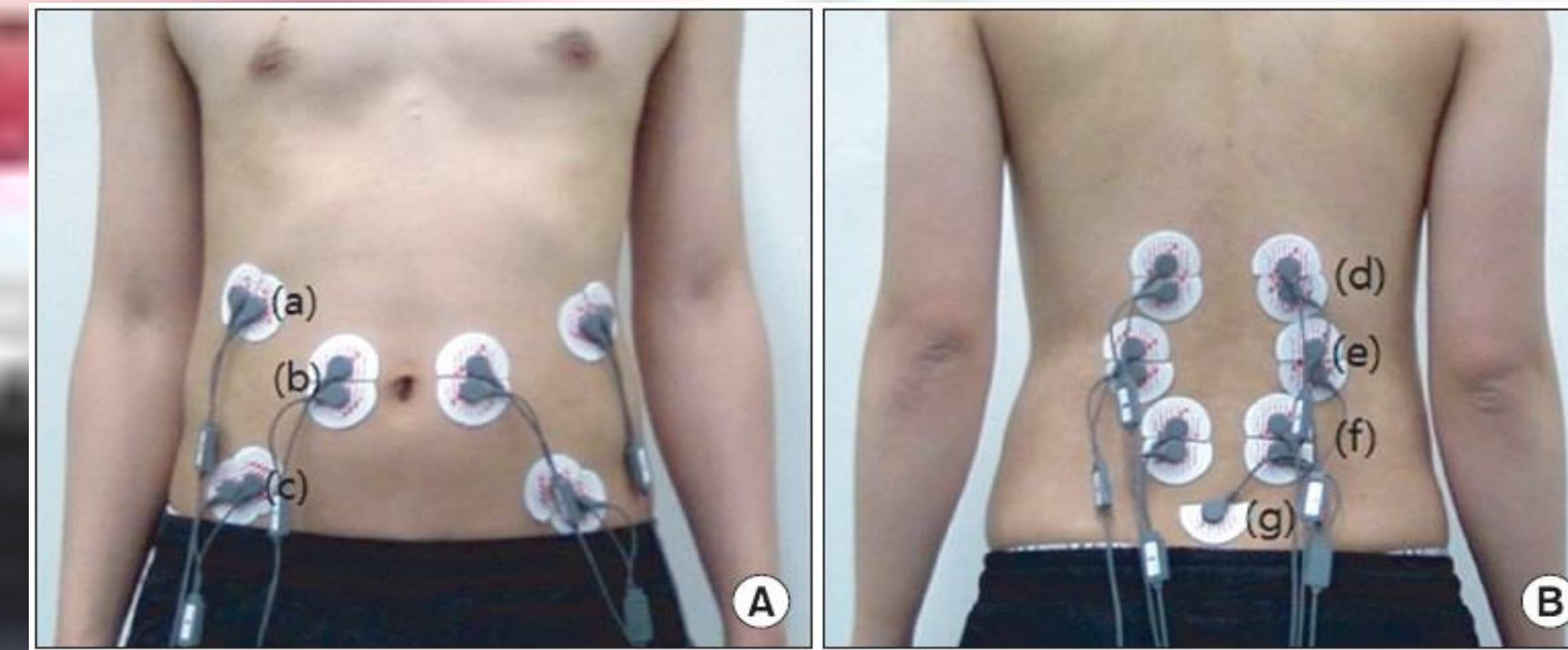


Figure 1: SEMG sensor placement for selected abdominal and lumbar muscles

| A – Ventral side                             | B – dorsal side             |
|--|-----------------------------|
| (a) External oblique abdominals              | (d) thoracic erector spinae |
| (b) Rectus abdominus                         | (e) lumbar erector spinae   |
| (c) Transverse abdominus – internal obliques | (f) multifidus              |
|  | (g) ground electrode        |

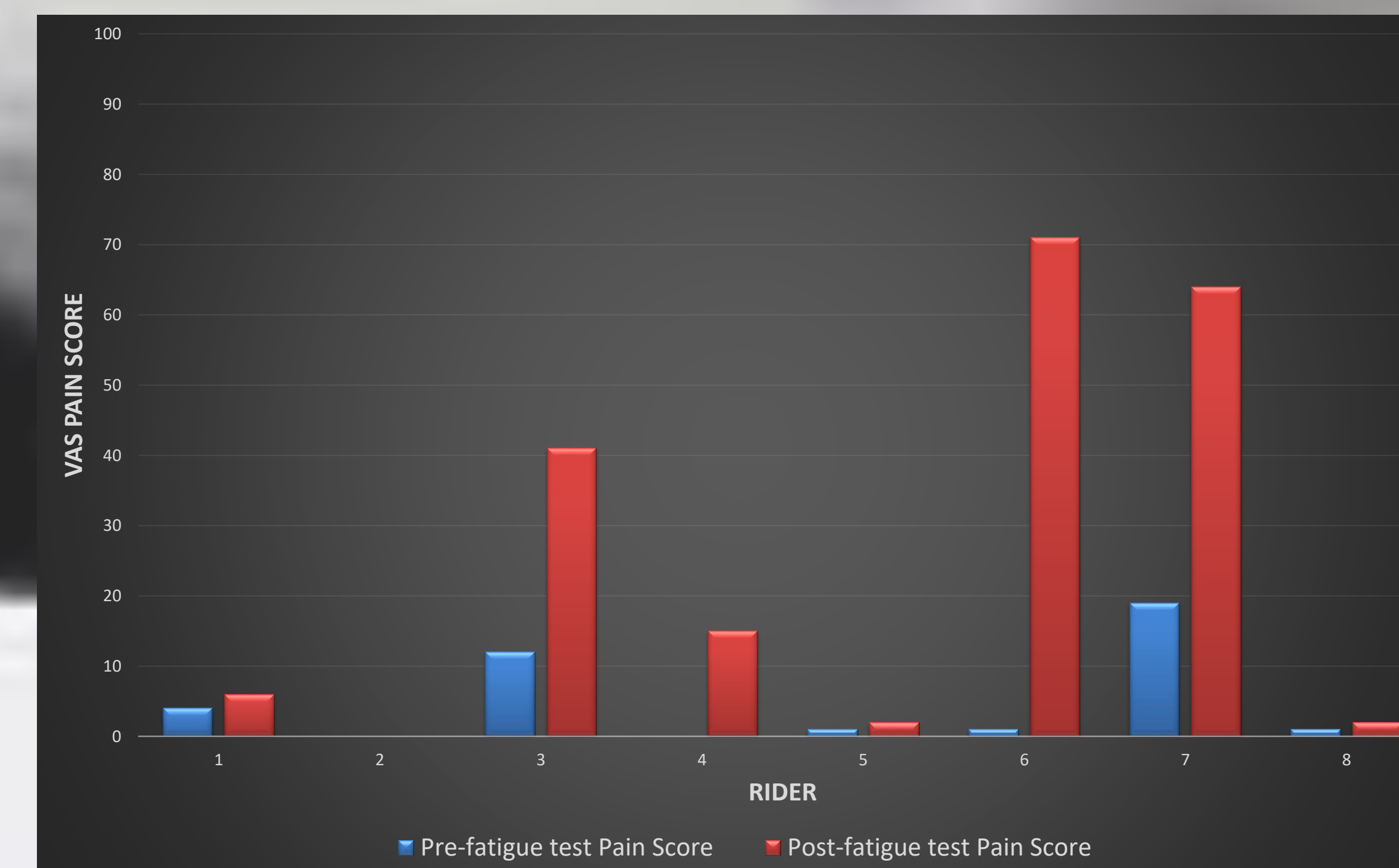


Figure 2: Pre- and post-fatigue test Visual Analogue Scale Score of Pain

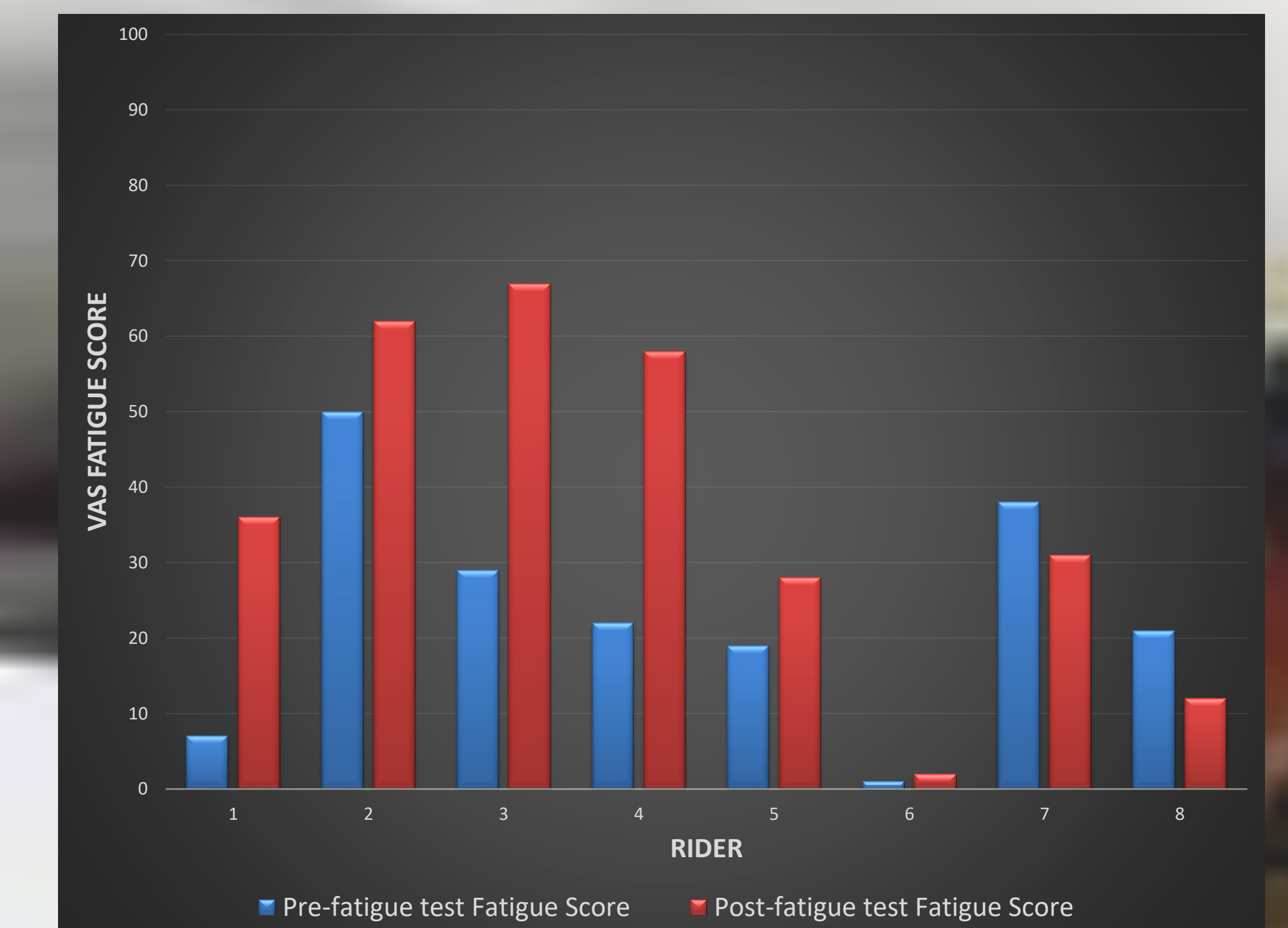


Figure 3: Pre- and post-fatigue test Visual Analogue Scale Score of Fatigue

**References:**

Lewis, V. and Kennerley, R. (2017). A preliminary study to investigate the prevalence of pain in elite dressage riders during competition in the United Kingdom. *Journal of Comparative Exercise Physiology*, 13 (4) 259-263.  
Lewis, V. and Baldwin, K. (2018). A preliminary study to investigate the prevalence of pain in international event riders during competition, in the United Kingdom. *Journal of comparative Exercise Physiology*, accepted for publication 6<sup>th</sup> May 2018.